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(54) (TITLE OF THE INVENTION) Inorganic decorative board having excellent antifouling properties and a manufacturing method thereof

(57) (ABSTRACT)
(PROBLEM) To provide an inorganic decorative board having excellent antifouling properties that generates very little peeling and is heat and fire resistant, from which adhered filth can be easily removed by wiping with a dry cloth when used around the kitchen in equipment such as a sink or a gas stove, and a manufacturing method thereof.
(MEANS FOR SOLVING) An inorganic decorative board in which a base coat layer, a picture printing layer, and a top-coat layer are sequentially laminated on the top surface of an inorganic substrate, wherein the top-coat layer is formed with a thermosetting resin paint containing a fluorine group.

[see source for figure]

(SCOPE OF PATENT CLAIMS)

(CLAIM 1) An inorganic decorative board wherein a base coat layer, a picture printing layer, and a top-coat layer are sequentially laminated on the top surface of an inorganic substrate, said inorganic decorative board having excellent antifouling properties and characterized in that said top-coat layer is formed with a thermosetting resin paint containing a fluorine group.

(CLAIM 2) An inorganic decorative board having excellent antifouling properties according to Claim 1 characterized in that said picture printing layer is formed by positioning and hot-pressing the transfer sheet of a configuration equipped with a picture printing layer formed on one side of a transfer sheet substrate such that the side having said picture printing layer and the base coat layer side of the inorganic substrate make contact, and then peeling off the transfer sheet substrate of said transfer sheet.

(CLAIM 3) A manufacturing method for an inorganic decorative board having excellent antifouling properties characterized in that it comprises a process wherein a transfer sheet formed by laminating a picture printing layer on one side of a transfer sheet substrate is prepared, a process in which a base coat layer is coated onto the surface of an inorganic substrate, a process in which the picture printing layer of said transfer sheet is positioned and hot-pressed such that it makes contact with the base coat layer of said inorganic substrate, a process in which a picture printing layer is formed on the surface of the base coat layer of said inorganic substrate by peeling off the transfer sheet substrate of said transfer sheet, and a process in which a top-coat layer is formed by coating and hardening a thermosetting resin paint containing a fluorine group on the surface of said picture printing surface.

(DETAILED DESCRIPTION OF THE INVENTION)

(0001)

(TECHNICAL FIELD OF THE INVENTION) The present invention relates to an interior design material, in particular, to an inorganic decorative board with favorable antifouling properties that is used around the kitchen in equipment such as a sink or a gas stove, and a manufacturing method thereof.

(0002)

(PRIOR ART) Conventionally known inorganic decorative boards used around the kitchen in equipment such as sinks and gas stoves include boards that are formed by establishing a picture printing layer on an inorganic substrate such as a calcium silicate board, an asbestos slate board, or a cement slate board using a method in which decorative paper on which a printed pattern has been formed is adhered, a method in which a picture pattern is directly printed on the inorganic substrate, or a method in which a picture pattern is transferred to the surface of the inorganic substrate using a transfer sheet, after which a top-coat is formed by applying a transparent coating from above the picture pattern layer, but such boards had the drawback that, when used in the kitchen in equipment such as sinks or gas stoves, lamp smoke or condiments such as soy sauce, other sauces, or curry would spread and attach to the surrounding walls, and the attached filth would be difficult to remove.

(0003) In order to resolve the drawback described above, boards in which a picture pattern is formed using a method in which a picture pattern is transferred to the surface of the inorganic substrate and a thermosetting resin or ionizing radiation setting resin is used as the transparent coating for the top-coat layer have been used as boards with excellent surface properties such as surface hardness, abrasion resistance, antifouling properties, and scratch resistance. However, while most filth can be removed from boards in which a thermosetting resin or ionizing radiation setting resin is used for the top-coat layer there is the problem that when a wet rag or detergent is used for filth removal, filth is left behind when wiped with a dry cloth, which is the simplest method of wiping, resulting in inferior antifouling properties.

(0004)

(PROBLEM TO BE SOLVED BY THE INVENTION) The present invention was conceived in light of these problems, and its purpose is to provide an inorganic decorative board having excellent antifouling properties that generates very little peeling and is heat- and fire-resistant, from which adhered filth can be easily removed by wiping with a dry cloth when used around the kitchen in equipment such as a sink or a gas stove, and a manufacturing method thereof.

(0005)

(MEANS FOR SOLVING THE PROBLEM) The means of the present invention for achieving the above purpose is an inorganic decorative board wherein a base coat layer, a picture printing layer, and a top-coat layer are sequentially laminated on the top surface of an inorganic substrate, characterized in that said top-coat layer is formed with a thermosetting resin paint containing a fluorine group. With this configuration, the top-coat layer is established on the top surface of the picture printing layer using a thermosetting resin paint containing a fluorine group, which improves the antifouling properties of the decorative board surface and enables the simple removal of filth by wiping with a dry cloth. Moreover, because the picture printing layer is formed on the surface of the base coat of the inorganic substrate without using decorative paper, it is possible to form an inorganic decorative board with no reduction in adherence even when used around water from a sink, for example, and with no worries regarding heat or fire resistance when used around a gas stove.

(0006) It is characterized in that it is configured such that said picture printing layer is formed by positioning and hot-pressing the transfer sheet of a configuration equipped with a picture printing layer formed on one side of a transfer sheet substrate such that the side having said picture printing layer and the base coat layer side of the inorganic substrate make contact, and then peeling off the transfer sheet substrate of the transfer sheet. As a result, it is possible to easily form a detailed picture-printing layer directly on the surface of the inorganic substrate without using decorative paper.

(0007) With a manufacturing method for an inorganic decorative board having excellent antifouling properties characterized in that it comprises a process wherein a transfer sheet formed by laminating a picture printing layer on one side of a transfer sheet substrate is prepared, a process in which a base coat layer is coated onto the surface of an inorganic substrate, a process in which the picture printing layer of said transfer sheet is positioned and hot-pressed such that it makes contact with the base coat layer of said inorganic substrate, a process in which a picture printing layer is formed on the surface of the base coat layer of said inorganic substrate by peeling off the transfer sheet substrate of said transfer sheet, and a process in which a top-coat layer is formed by coating and hardening a thermosetting resin paint containing a fluorine group on the surface of said picture printing surface, it is possible to easily and reliably manufacture an inorganic decorative board with excellent antifouling properties having the effects described above using a transfer method.

(0008)

(EMBODIMENT OF THE INVENTION) Concrete embodiments of the present invention will be described below with reference to the drawings. Figure 1 is a lamination cross sectional view showing an embodiment of the inorganic decorative board of the present invention, and Figure 2 is a lamination cross sectional view that describes an example of the manufacturing method for the inorganic decorative board of the present invention. In the figures, 1 is an inorganic decorative board, 2 is an inorganic substrate, 3 is a base coat layer, 3a is a sealer layer, 3b is a primer layer, 4 is a picture printing layer, 4a is a solid ink layer, 4b is a picture ink layer, 5 is a top-coat layer, 6 is a transfer sheet, and 7 is a transfer sheet substrate.

(0009) As shown in Figure 1, the configuration of inorganic decorative board 1 of the present invention is such that picture printing layer 4 and top-coat layer 5 are laminated on base coat layer 3 established on the surface of inorganic substrate 2. Picture printing layer 4 comprises solid ink layer 4a and picture ink layer 4b, and is formed on the surface of base coat layer 3 comprising sealer layer 3a and primer layer 3b established on the top surface of inorganic substrate 2 with a transfer method. Top-coat layer 5 is formed on the top surface of picture printing layer 4 with a thermosetting resin paint containing a fluorine group.

(0010) Examples of inorganic substrate 2 used for inorganic decorative board 1 of the present invention typically include cement boards such as calcium silicate boards, asbestos slate boards, lightweight foamed concrete boards, and hollow extruded cement boards, gypsum boards including gypsum slag boards, and fiber cement boards such as pulp cement boards, asbestos cement boards, and splinter cement boards.

(0011) Base coat 3 is established for the purpose of preventing alkaline constituent elution from inorganic substrate 2 and producing advanced designs as a result of improvements in the adherence of inorganic substrate 2 and picture printing layer 4 and the transferability of picture printing layer 4. Its configuration is arbitrary, and it can, of course, be further configured with a resin composition having both of these properties, but as a method of improving quality and performance, it is desirable to use a two-layer configuration comprising sealer layer 3a formed from a hardening resin such as a polyisocyanate resin, a moisture hardening urethane resin, or a styrene ester acrylate copolymer resin in order to prevent alkaline constituent elution, and primer layer 3b formed from an acryl urethane resin or ester methacrylate resin paint in order to improve the adherence and transferability of picture printing layer 4 to the surface of inorganic substrate 2. Furthermore, by coloring and making primer layer 3b nontransparent, it is possible to give the board concealment properties and prevent the effects of the substrate color when picture printing layer 4 that is formed on the substrate is laminated.

(0012) As transfer sheet 6 for the purpose of forming picture printing layer 4 on inorganic decorative board 1, it is preferable to use a configuration in which an arbitrary picture printing layer 4 is laminated on the polyolefin resin layer surface of transfer sheet substrate 7 that is completely covered by a polyolefin resin layer as a release layer on one side of a piece of thin paper. As transfer sheet substrate 7, material that is used as a substrate for an ordinary transfer sheet such as a plastic film such as a polyethylene film, a polypropylene film, or a polyester film, paper such as thin paper or pure white paper, or a composite film is used, and it is preferable for a material formed by laminating a polyolefin resin layer such as polypropylene on the top surface of a piece of thin paper to be used. In order to improve the thermal conductivity at the time of transfer, it is preferable for transfer sheet substrate 7 to be as thin as possible, but if it is too thin, then the substrate is prone to expansion at the time of printing such as gravure printing, causing decreases in printing aptitude. From the perspective of printing aptitude, it is desirable for the thin paper to be underpinned, and a configuration in which a 10 to 30 μm polyolefin resin is coated onto the thin paper. Moreover, by using a polyolefin resin such as polyethylene or polypropylene, it is possible to easily perform transfer operations by taking advantage of the thermal flexibility with regard to the irregular shape of the surface of inorganic substrate 2.

(0013) Picture printing layer 4 comprises solid ink layer 4a for full-surface solid printing and, for example, picture ink layer 4b that expresses surface patterns such as marble grain, blanket texture, and natural leather as well as abstract patterns. A general-purpose resin formed from an alkyd resin, a urethane resin, or a vinyl chloride resin is used as a vehicle for the ink that forms picture printing layer 4, and it is also possible to use appropriate mixtures of other additional agents such as organic or inorganic colorants, colorants such as stains, body colorants, stabilizers, plasticizers, or solvents as necessary.

(0014) Top-coat layer 5, which is formed on the outermost surface of inorganic decorative board 1 with excellent antifouling properties of the present invention, is formed from a thermosetting resin layer containing a fluorine group having contamination prevention functionality. It is desirable for a film with excellent surface properties such as antifouling properties, abrasion resistance, and solvent resistance to be used as the transparent resin that forms top-coat layer 5, and examples of such films include thermoplastic resins such as unsaturated polyester resins, epoxy resins, polyurethane resins, phenol resins, and melamine resins. Among these, a polyol constituent having an OH group (acryl polyol, polyester polyol, polyether polyol, epoxy polyol, fluorine polyol, etc.) is used as a base resin, and it is preferable to use a two-liquid hardening urethane resin formed by adding an isocyanate compound such as toluene diisocyanate, hexamethylene diisocyanate, or metaxylene diisocyanate to this as a hardening agent. Known coating means such as curtain flow coaters, roll coaters, or sprays can be used as the coating method, and it is preferable for the thickness to be 20 to 50 μm.

(0015) Examples of the thermosetting resin containing a fluorine group that forms top-coat layer 5 include a fluorine thermosetting resin formed by mixing a polyisocyanate compound into a fluoroolefin polymer as a hardener and a fluorine-added heat-setting resin formed by adding and mixing a low molecular weight fluorine compound thermosetting resin into a thermosetting resin.

(0016) An example of a fluorine polyol resin formed by mixing a polyisocyanate compound into a fluoroolefin polymer as a hardener is a copolymer containing fluorine that has

at least 10 wt% fluorine content based on fluoroolefin units and a hydroxyl group that is soluble in a solvent.

(0017) The fluorine-added agent that is mixed into the two-liquid hardening urethane resin that forms top-coat layer 5 is a surfactant that has a perfluoroalkyl group, in which all of the hydrogen atoms of an alkyl group are substituted by fluorine atoms in the molecule, a hydrophilic group, or a lipophilic group. Surface modification of the resin is performed utilizing the surface transferability of this perfluoroalkyl group, and the surface orientation is improved by collecting perfluoroalkyl groups in the same molecule, which enables transfer to the resin surface with the addition of a small quantity and the fluorine-modification of the resin surface. The resin surface is fluorine-modified when the quantity of the fluorine surfactant added is 0.5 to 1.0 parts by weight of the resin solid form, and the two-liquid hardening urethane resin surface becomes water and oil repellent, soil resistant, and non-adhesive.

(0018) Next, an example of the manufacturing method of inorganic decorative board 1 of the present invention will be explained using the drawings. First, as shown in Figure 2 (a), transfer sheet 6, on which picture printing layer 4 comprising picture ink layer 4b and solid ink layer 4a is established, is prepared on the top surface of transfer sheet substrate 7. Next, base coat layer 3 comprising sealer layer 3a and primer layer 3b is established on the top surface of inorganic substrate 2, as shown in Figure 2 (b). Next, as shown in Figure 2 (c), picture printing layer 4 of transfer sheet 6 is superimposed such that it opposes base coat layer 3 established on the top surface of inorganic substrate 2, and this is then hot-pressed from the surface of this transfer sheet 6. Next, as shown in Figure 2 (d), transfer sheet substrate 7 of this transfer sheet 6 is peeled off and picture printing layer 4 is established on the surface of base coat layer 3 of inorganic substrate 2. Furthermore, as shown in Figure 2 (e), a thermosetting resin containing a fluorine group is coated and hardened on the top surface of inorganic substrate 2 containing this picture printing layer 4, and as a result, top-coat layer 5 having antifouling properties is formed, and inorganic decorative board 1 with superior antifouling properties is thus obtained.

(0019)

(EXAMPLES OF EMBODIMENT)

EXAMPLE OF EMBODIMENT 1

A transfer sheet was created by printing a desired pattern on the polyethylene resin layer surface of a transfer sheet substrate in which a piece of thin paper weighing 40 g/m^2 was coated with a 20 μm thick polyethylene resin with a gravure rotary press using an alkyd resin ink. Separately, 30 g/m^2 of a moisture hardening urethane resin paint was applied to a 3 mm thick calcium silicate board as a sealer layer, and 100 g/m^2 of an acryl urethane resin paint was applied as a white primer layer and dried for 20 minutes at 80°C. Next, this was mounted on the surface of this white primer layer such that it opposed the picture printing surface of the transfer sheet, and then hot-pressed for 5 minutes at a platen temperature of 135°C and a pressure level of 15 kg/cm^2 and transferred. After the transfer sheet substrate of this transfer sheet was peeled off, a fluorine acryl urethane resin (made by Dainippon Ink and Chemicals (Inc.), DEFENSA TR-310) was applied to the picture transfer surface with a curtain flow coater such that the coating film thickness was 20 to 30 μm (dry) and dried for 20 minutes at 80°C, and an inorganic decorative board having antifouling properties was thus obtained on the surface.

(0020) EXAMPLE OF EMBODIMENT 2

A transfer sheet was created by printing a desired pattern on the polyethylene resin layer surface of a transfer sheet substrate in which a piece of thin paper weighing 40 g/m^2 was coated with a 20 μm thick polyethylene resin with a gravure rotary press using an alkyd resin ink. Separately, 30 g/m^2 of a moisture hardening urethane resin paint was applied to a 3 mm thick calcium silicate board as a sealer layer, and 100 g/m^2 of an acryl urethane resin paint was applied as a white primer layer and dried for 20 minutes at 80°C. Next, this was mounted on the surface of this white primer layer such that it opposed the picture printing surface of the transfer sheet, and then hot-pressed for 5 minutes at a platen temperature of 135°C and a pressure level of 15 kg/cm^2 and transferred. After the transfer sheet substrate of this transfer sheet was peeled off, a transparent coating into which 1 part by weight of a fluorine surfactant (made by Dainippon Ink and Chemicals (Inc.), DEFENSA MCF-323) was mixed was applied to 100 parts by weight of a two-liquid hardening acryl urethane resin with a curtain flow coater such that the coating film thickness was 20 to 30 μm (dry) and dried for 20 minutes at 80°C, and an inorganic decorative board having antifouling properties was thus obtained on the surface.

(0021)

(EFFECT OF THE INVENTION) With the present invention, as described above, a top-coat layer is formed on the surface of an inorganic substrate with a thermosetting resin containing a fluorine group, so the antifouling properties of the decorative board surface are improved, and it is thereby possible to inexpensively obtain an inorganic decorative board with excellent antifouling properties from which adhered filth can be easily removed by wiping with a dry cloth.

(0022) Moreover, because the picture printing layer is directly established on the base coat layer surface formed on the surface of the inorganic substrate using a transfer method without using printing paper, it is possible to form a decorative board with no reduction in adherence even when used around water from a sink, for example, and with no problems regarding heat or fire resistance when used around a gas stove, and this can be used as a kitchen back panel.

(BRIEF DESCRIPTION OF THE DRAWINGS)

(FIGURE 1) is a cross-sectional view showing an example of embodiment of the inorganic decorative board of the present invention.

(FIGURE 2) is a laminated cross-sectional view that describes an example of the manufacturing method for the inorganic decorative board of the present invention.

(EXPLANATION OF REFERENCES)

1	inorganic decorative board
2	inorganic substrate
3	base coat layer
3a	sealer layer
3b	primer layer
4	picture printing layer

4a	solid ink layer
4b	picture ink layer
5	top-coat layer
6	transfer sheet
7	transfer sheet substrate

(FIGURE 1)

[see source for figure]

(FIGURE 2)

[see source for figure]